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A RECORDING MEDIUM MENU SUPPORTING METHOD

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method of writing menu data to a high-density recording medium and providing the written menu data regarding selection of titles or chapters of a recording medium to be displayed onto an apparatus such as a digital television set.

2. Description of the Related Art

FIG. 1 shows a block diagram of a conventional DVD (Digital Versatile Disk) player being capable of reproducing a DVD and providing the reproduced data for a digital television set. The player 100 of Fig. 1 comprises an optical pickup 2 reading signals recorded in a DVD 1; an analog signal processor 3 binarizing the read signals after compensating levels of the signals; a digital signal processor 4 restoring the binarized signals into digital data; a parser 5 separating the restored data into encoded video, sub-picture, and audio data; a video decoder 6 decoding the encoded video data

to non-compressed original video data; a sub-picture decoder 7 decoding the sub-picture data; an audio decoder 8 decoding the encoded audio data to non-compressed original audio data; and a re-encoder 9 encoding the decoded audio and mixed data of the decoded video and sub-picture data again to audio and video stream whose format is suitable to a digital television set 200.

In the DVD player 100, the read signals by the pickup 2 are restored to original video and audio data and then re-encoded to A/V stream acceptable to the digital TV set 200. The acceptable data stream is transmitted to the digital TV set 200 which presents the received video and audio data of the data stream through its screen and speaker, respectively.

The read and separated sub-picture data, which includes captions and menu data, are mixed, after being decoded, with the decoded original data from the video decoder 6, and are re-encoded to TV acceptable A/V data stream. Therefore, the digital TV set 200 should be able to separate sub-picture data from the mixed video data and process it in order to present menu picture and/or caption for titles and/or chapters recorded in the DVD 1 on its screen.

However, in general, a digital TV set has not function to separate and decode sub-picture data for menu, and present it with background picture in still for user's menu selection. In addition, it has not menu supporting function such as highlighting a specific window on a full screen according to an arbitrary selection from a user, either. Therefore, in order to construct menu screen, a DVD player has to search both of video data for background and sub-picture data for menu items such as highlighted box, etc. respectively,

decode each data, mix them, and re-encode the mixed data to data stream suitable to a digital TV set.

However, such operations have a drawback that very complicated hardware is required for constructing a menu screen as above.

In the meantime, a reproducing/recording apparatus of a high-density recording medium such as a high-density DVD (called 'HDVD' hereinafter), whose recording format standard is under discussion among related companies, is most likely to be connected with a digital TV set to make recorded high-quality moving pictures be presented much better. Thus, a new efficient method other than the above is urgently required in order that titles or chapters recorded in a high-density recording medium may be selected in a menu displayed on a digital TV set.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a method of making it possible to present title or chapter menu of a high-density recording medium with a digital television set through writing an additional video data for menu and their management data and transmitting written menu data, if necessary, to a digital television set in a TV-acceptable video format.

A recording medium according to the present invention, includes written data composed of: real-time data belonging to one or more titles and/or chapters; and menu data belonging to a plurality of menu pictures, each picture having data contents differentiating each included menu item distinctively from the other menu items.

Another recording medium according to the present invention,

includes written data composed of: real-time data belonging to one or more titles and/or chapters; menu data belonging to a plurality of menu pages; and OSD data for differentiating each menu item, included in one of the menu pages, distinctively from the other menu items in the same menu page.

A method for supporting menu of a recording medium according to the present invention, checks menu management information of the recording medium when menu is requested, searches for data of a menu page corresponding to the requested menu based on the menu management information, reads the data, transmits the read data of the menu page to an external apparatus connected through a digital interface, generates OSD (On Screen Display) data for differentiating a selected menu item distinctively from others included in the transmitted menu page, and transmits the OSD data through the digital interface.

Another method for supporting menu of a recording medium according to the present invention, checks menu management information of the recording medium when a menu item is selected in an outputted menu picture, searches for data of a menu picture in which the selected menu item has been differentiated distinctively from other items, based on the menu management information, reads the data, and transmits the read data of the menu picture to an external apparatus after modulation.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention, illustrate the preferred embodiments of the invention, and together with the description,

serve to explain the principles of the present invention.

In the drawings:

FIG. 1 shows a block diagram of a conventional DVD player being capable of reproducing a DVD;

Figs. 2 and 3 are schematic block diagrams of a high-density DVD player and a digital television set which a menu supporting method according to the present invention is applicable to;

Figs. 4 and 5 depict hierarchical data structures recorded in a high-density recording medium according to a menu supporting method of the present invention;

Fig. 6 depicts an embodiment organizing menu form from real A/V data;

Fig. 7 shows various menu status outputted in accordance with different menu item selection;

Fig. 8 is menu data stream format recorded in a high-density DVD according to a menu supporting method of the present invention;

Fig. 9 depicts a menu data transmitting method according to the present invention;

Fig. 10 is menu data stream format recorded in a high-density DVD according to another menu supporting method of the present invention; and

Fig. 9 depicts another menu data transmitting method according to the present invention.

DETAILED DESCRIPTION OF THE PREFFERRED EMBODIMENT

In order that the invention may be fully understood, a preferred embodiment thereof will now be described with reference to the

accompanying drawings.

Fig. 2 is a schematic block diagram of a HDVD player and a digital television set which a menu supporting method according to the present invention is applicable to.

A HDVD player 110 of Fig. 2 comprises a reading unit 12 searching A/V data and menu video data, which have been encoded with MPEG II standard, and reading out them; a controller 14 conducting reproduction operation through controlling the reading unit 12 at playback request from a user; and re-modulator 13 modulating the read A/V data or menu video data with VSB (Vestigial Side Band). A digital television set 210 of Fig. 2 comprises a demodulator 21 demodulating the modulated signal from the high-density DVD player 110 with VSB; an MPEG decoder 22 decoding the demodulated data stream to original video and audio data, if included; and a presenting unit 23 presenting the decoded video and audio data.

The reading unit 12 reproduces the recorded data of a selected type among A/V, menu, and navigation data. The controller 14 controls the reading unit 12 to select the data type according to various user's requests.

If program playback for a title or a chapter written in the high-density recording medium 11 is requested from a user, real-time A/V data are selected by the controller 14 and reproduced by the reading unit 12. The read A/V data are VSB-modulated by the re-modulator 13 to be transmitted to a digital television set 210. If menu display is requested, menu data are selected for reading out by the controller 14. Therefore, corresponding menu data are read by the reading unit 12 and are then VSB-modulated and transmitted.

This menu data will be presented in still picture by the digital television set 210.

Fig. 3 is another schematic block diagram of a HDVD player and a digital television set which another menu supporting method according to the present invention is applicable to.

A HDVD player 120 of Fig. 3 comprises a reading unit 32 searching real-time A/V data and menu video data, which have been encoded with MPEG II standard, and reading out them; OSD (On Screen Display) data generator 34 generating OSD data, which will be mixed with menu video data in a digital television set to highlight a menu item or display a text, based on menu management information written in a HDVD 31; a controller 35 controlling the reading unit 32 and the OSD data generator 34 according to a user's request; and an interfacing unit 33 transmitting A/V data from the reading unit 32 through isochronous channel of IEEE 1394 standard and OSD data from the OSD data generator 34 through asynchronous channel, respectively.

The OSD data generated by the OSD data generator 34 satisfies the standard EIA775 for OSD data transmission.

A digital television set 220 of Fig. 3 comprises an interfacing unit 41 receiving A/V data and OSD data from the HDVD player 120 through isochronous and asynchronous channel, respectively; an MPEG decoder 42 decoding the received A/V data to original video and audio data, if included; a mixer 44 mixing the received OSD data and the decoded video data; and a presenting unit 43 presenting the decoded video and audio data.

The controller 35 of the HDVD player 120 controls the reading unit 32 to select data type according to various user's requests and

to reproduce the recorded data of the selected type. The real-time A/V data and menu video data, which are for selecting a chapter or a title written in the HDVD 31, read by the reading unit 32 are transmitted to the digital television set 220 through the isochronous channel. In case that menu video data are transmitted, the OSD data generator 34 generates OSD data for decorating specific window as highlighted or for displaying descriptive text of a chapter or title item, based on the read menu video data and the menu management information, and transmits the generated OSD data through asynchronous channel of the interfacing unit 33.

The digital television set 220 decodes the received A/V data and the menu video data through the MPEG decoder 42. The decoded data are mixed with OSD data, if received, by the mixer 44, and then presented through the presenting unit 43. The menu video data are displayed in still picture with the received OSD data which will be explained below.

Fig. 4 depicts hierarchical data structure recorded in a high-density recording medium according to a menu supporting method of the present invention.

The high-density recording medium is partitioned into a file system area and video zone. The video zone contains several titles and VMG (Video Manager) data which consist of A/V menu data for VMG and navigation data for the A/V menu data. Each title consists of real-time A/V presentation data and their navigation data which includes general information and menu information. The presentation data consist of A/V menu data for title and real-time A/V data of title contents.

The A/V menu data for VMG included in the VMG data are for top menu whose menu items are selection and/or alteration of title and disk information whereas the A/V menu data for titles included in the presentation data are for sub menu whose menu items are selection and/or alteration of information of chapters belonging to a title.

The A/V menu data for VMG may be partitioned into two menu sections of A/V menu data for VMG and A/V menu data for titles as shown in Fig. 5.

The menu supporting method according to the present invention reads out an appropriate A/V menu data for selecting a title or a chapter recorded in a high-density recording medium with reference to menu navigation data written as above, and transmits the read A/V menu data to a digital television set to be presented thereon. This menu supporting method is described hereinafter in detail.

The menu supporting method to be explained is for the configuration of Fig. 3 which has OSD function observing EIA775 standard and IEEE 1394 interface being able to send/receive OSD data.

If a single menu page consists of six menu items of four thumbnails for titles and two direction icons to switch to previous or next menu page as shown in Fig. 6, video menu data for each different basic menu page in which four thumbnails for different four titles and two icons are contained have been written as A/V menu data for VMG. The menu management information, which is used to generate OSD data necessary for indicating which menu item, that is, title thumbnail is selected, has been also included in the A/V menu data for VMG. A thumbnail icon of a title or a chapter is composed of image data sampled from a picture included in a corresponding title or

chapter as shown in Fig. 6.

Data of each basic menu page are grouped into a single high-density stream object (called 'HOB' hereinafter) as shown in Fig. 10.

In the case that menu data have been written as aforementioned, if six selected cases for a single menu page (for selecting one among titles 1 to 4) are to be furnished, one basic menu page is read and provided for a digital TV set and mutually different OSD data for differentiating, for example, highlighting a selected menu item are generated based on user's selection and related menu management information, and then provided, too.

To be brief, the six cases for item selection shown in Fig. 7 are built up by one basic menu page and six different OSD data.

Another menu supporting method to be explained is for the configuration of Fig. 2 in which VSB-modulated signal is transmitted from a HDVD player to a digital TV set.

If a single menu page consists of six menu items of four thumbnails for titles and two direction icons like as in the above menu supporting method, video data for six menu pictures have been written for one menu page, for example, for selecting one among titles 1 to 4. Each menu picture is to distinguish which menu item is selected in a menu page.

To be brief, the six cases for item selection shown in Fig. 7 are built up by six mutually different menu pictures.

In this menu supporting method, data of each menu picture are grouped into a HOB.

Fig. 8 is menu data stream format recorded for the case that

menu data are delivered through VSB modulation.

Menu data of all menu pictures, which are recorded in format of MPEG II transport stream, form a plurality of HOBs, called 'VMG HOB's. The 'VMG HOB's consist of a HOB containing the first menu picture for the first menu item selected in the first menu page, next HOB containing the second picture for the second menu item selected in the first menu page,…., and the last HOB containing the last picture for the sixth menu item selected in the last menu page. A null data pack may be inserted between menu pictures, that is, neighboring two HOBs.

In addition, the address information of start ('Menu_P_HOB_SA's #11,#12,..,#n6,..) and end ('Menu_P_HOB_EA's #11,#12,..,#n6,..) for each menu HOB is written as the navigation data for the A/V menu data.

If an arbitrary menu item is selected by a user in the menu displayed according to the menu request, the controller 14 of the HDVD player 110 determines which menu picture is to be displayed based on the selected item and menu management information, and reads start and end address of a HOB associated with the determined menu picture from the menu navigation data. Referring to the read addresses, the controller 14 reads data stream corresponding to a menu picture in which the selected menu item has been highlighted, and controls the reading unit 12 to select menu picture data instead of real A/V data stream. Through these operations, a menu picture in which a selected menu item is differentiated distinctively from others is transmitted with VSB-modulated and displayed onto a screen of the digital television set 210.

In order that a menu picture may be displayed in still, data for a single menu picture consist of single Infra-coded picture (called 'I-picture' hereinafter) and one or more predictive pictures (called 'P-picture's hereinafter) as shown in Fig. 9. The P-picture has same picture contents with the I-picture, however, it is different from the I-picture in data compressed way. When transmitting data of a menu picture, one or more P-pictures may be sent sequentially more than once after the preceding I-picture is sent. Such operation of transmitting an I-picture once and next one or more P-pictures once or more is conducted repeatedly until other menu page or other menu item is selected from a user.

Therefore, the digital television set receives I-pictures and P-pictures continuously and displays same page contents repeatedly. As a result, a menu page is presented to a user in still picture without a special operation of a digital television set.

Fig. 10 is menu data stream format recorded for the case that OSD data for differentiating a menu item from others are delivered through digital interface of IEEE 1394.

In the data configured as Fig. 10, the VMG HOBs, which contain menu data of MPEG II transport stream format, consist of a HOB containing the first menu page, next HOB containing the second menu page,…., and the last HOB containing the last menu page. A null data pack may be appended to each menu page except the last page, that is, inserted into neighboring two HOBs. In addition, the address information of start ('Menu_P_HOB_SA's #1,#2,..,#n,..) and end ('Menu_P_HOB_EA's #1,#2,..,#n,..) for each menu HOB is written as the navigation data for the A/V menu data.

If an arbitrary menu page is requested from a user, the controller 35 of the HDVD player 120 determines which menu page is to be displayed based on the menu management information, and reads start and end address of a HOB associated with the determined menu page from the menu navigation data. Referring to the read addresses, the controller 35 reads data stream corresponding to a menu page to be transmitted through the isochronous channel of the interfacing unit 33. At the same time, the controller 35 searches the menu management information for materials for highlighting a menu item selected in the transmitted menu page or displaying descriptive text of a selected menu item, and generates EIA775 standard-conformed OSD data corresponding to the materials through the OSD data generator 34. This OSD data are transmitted to a digital television set through the asynchronous channel of the interfacing unit 33.

Like as the explanation for the case of Fig. 9, the transmitted data of a menu page are also composed of an I-picture and one or more P-pictures which are sent in their recorded order and repeatedly as shown in Fig. 11. The unique difference between the cases of Figs. 9 and 11 is that a basic menu page in which an OSD data will emphasize a selected menu item is transmitted in Fig. 11 whereas a menu picture in which a selected menu item has been already marked distinctly is sent in Fig. 9.

The above explained menu supporting method of the present invention can display selection menu for a high-density recording medium onto a digital television set in still picture as well as differentiate a selected menu item distinctly from others, so that it is possible for a user to know which menu item is selected at

present and to choose a menu item of a title or a chapter to be reproduced from a high-density recording medium, based on the menu status displayed on a digital television set.

The invention may be embodied in other specific forms without departing from the sprit or essential characteristics thereof. The present embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.